# Do Emerging Market Hedge Fund Managers Lack Skills?

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Abstract

Hedge funds should be well equipped to take advantage of opportunities in emerging markets due to their flexibility in investment strategy and lockup periods. However, the findings in this paper show that emerging market hedge funds have not been able to provide absolute return in any period between 1994 and 2004. Also, the strategy in question does not present the investor with any benefits that would be valuable in a hedge fund portfolio. Despite the underperformance of these funds in terms of alpha, they have received an almost exponential inflow of capital during the most recent years. However, the strategy's share of the industry's total capital flow has decreased significantly during the same period, indicating that investors have reallocated money to other hedge fund strategies.

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# 1 Introduction

This paper investigates the combination of emerging markets and hedge funds from the investors' point of view. Investing in emerging markets poses different challenges compared to investments in developed markets. However, given the degrees of freedom in investment strategies and the opportunity to lock in capital over longer periods, hedge funds should be well equipped to deal with the characteristics of emerging markets, and hence provide value from active management. The question of interest is - have they succeeded in doing so?

Little research has previously been done on the combination of emerging markets and hedge funds. The analysis in this paper is performed on a strategy level, and investigates the performance and capital flows of emerging market hedge funds during 1994 to 2004. The research questions are the following. Firstly, as a hedge fund investor, such as a large institutional investor or a fund-of-funds, should you have invested in emerging market hedge funds? And if so, how much of your hedge fund portfolio should have been allocated to emerging markets? And secondly, to what extent have investors allocated money to emerging market hedge funds during the period studied?

There are two main (expected) benefits that motivate investments in any assets. The first is if the asset provides a superior return relative to alternative investments, and the second is if it offers diversification benefits in a portfolio of assets. The analysis reveals that emerging market hedge funds have, on average, not been able to provide return above the systemic risk exposures, i.e. alpha, in any period between 1994 and 2004. Also, the strategy in question does not present the investor with any benefits that would be valuable in a hedge fund portfolio. This is shown by the portfolio optimization results that clearly indicate that the weight in emerging markets in a hedge fund portfolio should have been zero throughout the period.

Despite the underperformance of these funds in terms of alpha, they have received an almost exponential inflow of capital during the most recent years. However, the strategy's share of the hedge fund industry's total capital flows has decreased significantly during the same period. Thus, indicating that investors have reallocated their money from emerging market hedge funds to other hedge fund strategies.

If hedge funds fail to deliver alpha, the returns of those funds could be achieved in a much cheaper way through passive investments, rather than paying the high fees charged by hedge funds. The underperformance of emerging market hedge funds has surprisingly not had a great effect on fees. The average performance fee charged increased over the period studied, mainly driven by the higher fees of small funds.

Mainly two previous papers deal with the issues of hedge funds and emerging markets, Eichengreen, Mathieson, Chadha, Jansen, Kodres and Sharma (1998) and Fung and Hsieh (2000). The objective in both studies is to determine to which extent hedge funds have exerted market impact. After the devaluation of the Sterling in 1992 and the Asian crisis in 1997, it has been suggested that hedge funds earn superior returns at the cost of financial stability. However, both Eichengreen et al. (1998) and Fung and Hsieh (2000) find little evidence of hedge funds exerting market impact and no evidence that hedge funds use positive feedback trading strategies or that hedge funds are likely to herd other investors.

The returns of hedge funds have been thoroughly investigated in the literature. The focus has been on the claim of market neutrality and finding a suitable factor model for evaluating hedge fund alpha. Fung and Hsieh (1997), Fung and Hsieh (2001), Mitchell and Pulvino (2001), and Agarwal and Naik (2004) show that hedge funds' exposures to risk factors have option-like features. Building on that, Fung and Hsieh (2004*b*) use asset-based style factors to create hedge fund benchmarks that capture the common risk factors in hedge funds. They identify seven risk factors that can jointly explain between 60 and

80 percent of return movements in hedge fund portfolios.

Despite not being market neutral, many papers still claim that hedge fund groups display positive unexplained returns, providing evidence of manager skill (see for example Liang (1999)). Fung and Hsieh (2004*a*) show empirically that Equity Long/Short hedge funds have significant alpha to both conventional as well as alternative risk factors. Kosowski, Naik and Teo (2005) examine hedge fund returns using a bootstrap methodology, showing that the performance of the top hedge funds cannot be attributed to chance alone.

A question of recent interest is the persistence of alpha over time. In Chan, Getmansky, Haas and Lo (2005) they conclude that expected returns of hedge funds are likely to be lower and that systemic risk is likely to increase in the future. Fung, Hsieh, Naik and Ramadorai (2006) investigate whether the alpha generated by funds-of-hedge-funds has varied over time. They find that fund-of-funds' alphas have declined substantially in the most recent period in their data, from 2000 until the end of 2004. Naik, Ramadorai and Stromqvist (2006) perform their analysis on eight broad hedge fund strategies, and find that performance has deteriorated in recent years for most strategies, presenting evidence that alpha is subsequently low for funds experiencing high capital inflows. Both papers conclude that capacity constraints are partly responsible for decreasing returns.

An important issue in the emerging market setting is investments in illiquid assets. Getmansky (2004) shows that hedge funds in illiquid categories are subject to high market impact and have limited investment opportunities. Aragon (2006) finds a positive, concave relation between the returns and the share restrictions of hedge funds. He concludes that previously documented positive alphas can be interpreted as compensation for holding illiquid fund shares.

The outline of the paper is as follows. The next section discusses hedge funds in the context of emerging markets. Section three presents the data and some summary statistics. Then

the performance and portfolio allocation of emerging market hedge funds are investigated in the next two sections. Section six analyzes the investor behavior over the sample period, and section seven discusses the skills of emerging market hedge fund managers. The evolution of performance fees is investigated in section eight and the last section concludes.

# 2 Emerging Markets and Hedge Funds

This section presents some of the features of emerging markets and how they relate to the hedge fund setting.

According to Eichengreen et al. (1998), hedge fund managers are attracted to emerging markets because of the opportunity of identifying fundamentals that are far out of line. Such events would cause large changes in asset prices (and hence associated profits) when they finally occur. In these situations the risk of large capital losses would be very low.[1] Also, in countries with a weak currency, foreign investors get more value for their dollars. Cheap funding allows hedge funds to take and hold a position in emerging markets even when they are uncertain about the timing.

Although emerging markets present investors with good investment opportunities, there are also less attractive features. In emerging markets, limited liquidity and the limited size of accepted deals can constrain the ability of hedge funds to build up positions. On the other hand, once they have entered large positions, they can be difficult to off-load and thus the profits may not be realized in time. High transaction costs also pose a problem to investors. In a survey by Chuhan (1992), poor liquidity is mentioned as one of the main reasons that prevented foreign institutional investors from investing in emerging markets.

[1] An example is the Argentine crisis in 2001. The government of Argentina defaulted on its debt, and the Argentine peso, which used to be pegged at par with the U.S. dollar, reached lows of 3.9 per U.S. dollar (Daseking, Ghosh and Thomas (2004)). Hence, during the Argentine crisis there was a large probability that the exchange rate would be devalued but almost no probability that it would be revalued.

Hedge funds are also known for not wanting to disclose more information than necessary regarding their trades. Anonymity is particularly difficult to maintain in smaller, less liquid markets. In Eichengreen et al. (1998) it is stated that hedge fund managers are wary of being identified as on the other side of the government or central bank's transactions of fear of economic retaliation or political retribution.

Given the characteristics of emerging markets, hedge funds have several advantages over traditional investment vehicles when investing in these markets. Hedge funds have the opportunity to both take long and short positions, thus being able to better take advantage of the volatility in emerging markets. Another advantage is the possibility to use leverage and derivatives. Hedge funds also have the opportunity to lock in their investors for a period of time, and thus better handle illiquid assets, not having to worry about withdraws from the fund.

# 3 Data and Summary Statistics

## 3.1 Hedge Fund Data

In this paper, hedge fund data from four large databases are used; HFR, TASS, CISDM (formerly ZCM/MAR), and MSCI, giving a representative sample of the hedge fund industry. The monthly data begin in January 1994, and end in December 2004, and include dead funds. Only funds that report assets under management (AUM) are included in the dataset. All funds that have an inflow greater than 500 percent or outflow greater than 100 percent of the previous month's AUM are eliminated. Thus, the total dataset consists of about 7600 hedge funds of which 418 funds are classified as emerging market hedge funds. Table I shows that the average life of emerging market hedge funds is 4.4 years and the average size is about 76 million dollars over the sample period. This can be compared to the numbers for the non-emerging market hedge funds for which the average life is 4.5

years and the average amount of assets under management is 100 million dollars.

The geographical distribution of focus markets for emerging market hedge funds is shown in Figure 1. A majority of the funds do not focus on a specific market, but on emerging markets in general. Sixteen percent of the funds invest mainly in Asia and the corresponding numbers for Europe and Latin America are 11 and 9 percent, respectively. Figure 2 displays the geographical distribution of the management companies, defined as the location of their headquarters. The three largest groups are U.S. (32%), Europe (23%) and offshore[2] (21%). United Kingdom (London) dominates the European funds, standing for 18 percent of the 23 percent of funds located within Europe.

Table II displays the geographical distribution of assets under management at the end of each year. Panel A presents the evolution depending on which market the funds are focusing on. The global hedge funds have managed about 70 percent of the strategy's assets under management from 1994 to 2004. The funds focusing on Asia have had a share of around 15 to 20 percent during the period with a peak at the end of 1998. However, there seem to have been a shift from investing in Europe to investing in Latin America during the sample period. In 1994, no funds focused soley on Latin America, but the share then increased to 13 percent of the strategy's AUM in 2004. The opposite pattern can be seen in funds focusing on Europe, which only manage 2 percent of the total AUM in 2004. Panel B shows the figures depending on where the management company is located. Although only one-third of the funds are U.S. funds, they manage about 70 percent of the strategy's assets. Also European funds manage a substantial share of the capital, although the share has decreased over the period. Offshore funds have managed about 14 percent of the AUM on average over the period. While Asian funds have increased their influence, Latin American funds have stayed at only a few percent of the total strategy

[2] Offshore funds are defined as funds located in offshore jurisdictions, designed to allow investment in a fund without being exposed to the strictures of tax law in any given onshore legislation. Examples of offshore locations are the Cayman Islands, Bahamas, Bermuda and the British Virgin Islands.

AUM.

### 3.1.1 Return Data

Value-weighted excess return indices are computed at a strategy level and are constructed as

$$r_{st}^{VW} = \sum_{i=1}^{N} w_{it}(r_{it} - r_{ft}) \tag{1}$$

where

$$w_{it} = AUM_{it-1} / \left( \sum_{i=1}^{N} AUM_{it-1} \right) \tag{2}$$

are AUM weights reconstructed each month, $r_{it}$ is the net-of-fee return on fund $i$ in month $t$, $r_{st}$ is the return in month $t$ for strategy $s$ and $r_{ft}$ is the return of the three-month U.S. Treasury bill in month $t$.

Table I shows that the average monthly excess return for emerging market hedge funds during 1994 to 2004 is 0.48 percent. The median, however, is more than twice as high as the mean, 1.18, indicating that there are some high negative returns in the sample. This can be seen in the minimum, which is as much as -23 percent in the month of August 1998. This was a period of turbulence with the Asian and Russian crises as well as the crisis of Long-Term Capital Management (LTCM). The maximum monthly return is 15 percent in December 1999, during the technology boom. The large spread of returns over the sample period is shown in the standard deviation of almost five percent per month. Non-emerging market hedge funds have a slightly higher average return and lower volatility, as can be seen in Table I.

### 3.1.2 Flows

The dollar flows for each fund are calculated as follows:

$$F_{it} = AUM_{it} - (1 + r_{it})AUM_{it-1} \tag{3}$$

The AUMs are assets under management at the end of the month, and it is assumed that flows came in at the end of the month, after the accrual of returns. Flows at the strategy level are calculated by aggregating individual fund flows and scaling the dollar flows by strategy-aggregated end-of-previous-month AUM:

$$f_{st} = \left(\sum_{i=1}^{s} F_{it}\right) / \left(\sum_{i=1}^{s} AUM_{it-1}\right) \tag{4}$$

Table I displays summary statistics for the strategy flow as a percentage of the strategy AUM. The mean monthly flow for emerging market hedge funds is 0.4 percent of last month's AUM with a median of 0.44 percent. The standard deviation is 1.44, revealing large discrepancies in monthly flows. Again, the minimum, i.e. the largest monthly outflow, of -3.83 percent occurs during 1998 (October). The highest inflow, 4.22 percent, coincides with Federal Reserve's sudden increase in interest rates in February 1994. The flow for the average non-emerging market fund is twice as high and the volatility is only half of that of emerging market funds. Although the maximum flow is about the same for the two strategies, the largest outflow for non-emerging market funds is only 0.82 percent, three percent less that for emerging market funds.

### 3.1.3 Factor Return Data

In order to calculate the systematic component of the strategy index return, index returns are regressed on the factors in Fung and Hsieh (2004*b*), with some smaller adjustments. To represent the market return, the excess return on MSCI World Index (World) is used instead of S&P 500. The world index includes both developed and emerging markets and, hence, is a good benchmark when comparing the two investment categories. The set of factors then also consists of the excess return on a small minus big factor (SMB) con-

structed as the difference of the Wilshire small and large capitalization stock indices; three portfolios of lookback straddle options on currencies (PTFFX), commodities (PTFCOM) and bonds (PTFBD), which are constructed to replicate the maximum possible return to a trend-following strategy on the underlying asset, all in excess returns; the yield spread of the U.S. ten year Treasury bond over the three month T-bill, adjusted for the duration of the ten year bond (BD10), and the change in the credit spread of the Moody's BAA bond over the 10 year Treasury bond, also appropriately adjusted for duration (BAA).

# 4 Performance

As a first step, the second panel in Table I compare the return characteristics of emerging market funds and non-emerging market funds. The value-weighted return index for non-emerging funds have a slightly higher average monthly return than emerging market funds (0.51 compared to 0.48 percent) but the standard deviation in the return series is much lower, 1.7 percent compared to 4.7. Secondly, to see the development of the two groups over time, the cumulative total excess returns are plotted in Figure 3. The figure illustrates that emerging market hedge funds have underperformed non-emerging market funds over the period. An investment of 100 dollar in emerging markets at the beginning of 1994 was worth 163 dollars at the end of 2004, compared to 193 dollars for non-emerging market hedge funds. The underperformance is mainly due to the period from the end of 1997 to the end of 1998. In the first three quarters of 1997, emerging market funds outperformed other strategies. But then the return plunged around the same time the Asian crisis started. The performance of emerging market funds did not stabilize until a year later, and has since had a similar development as non-emerging market funds.

Table III presents the number of live emerging market funds at the end of each year in the dataset, as well as the number of funds that entered and exited the data during the year. The data do not discriminate between funds that exited due to liquidiation or if they just

stopped reporting. However, it seems reasonable to assume that the the large percentages of funds exiting in 1998 and 2001 (almost one third of the funds) were liquidated after the crises. This would indicate that these funds are sensitive to tail risk.

Figure 3 displays the evolution of total returns. However, the main goal for a hedge fund strategy is to deliver absolute return, i.e. return uncorrelated with systemic risk factors. Thus, the hypothesis tested in this section is the following:

**Hypothesis 1:** *Given hedge funds' flexible investment rules, they should be able to take advantage of investment opportunities in emerging markets and thus generate risk-adjusted returns (alphas).*

## 4.1 Factor Regressions

Even though Figure 3 shows that emerging market funds have underperformed non-emerging market funds when looking at total returns, the figure does not say anything about the performance of absolute returns or what systematic risk factors funds have been exposed to. To test hypothesis 1, the alpha is extracted using the methodology described below. The results are also compared to those for non-emerging market hedge funds, which represent an alternative investment strategy.

### 4.1.1 Methodology Factor Regressions

The absolute returns are calculated as the intercept when running a regression of emerging market hedge fund index return on the seven-factor model of Fung and Hsieh (2004*b*) (see section 3.1.3). The following equation is estimated:

$$r_{st} = \alpha + \beta X_t + \varepsilon_t \tag{5}$$

where

$$X_t = [World_t \; SMB_t \; BD10_t \; BAA_t \; PTFBD_t \; PTFFX_t \; PTFCOM_t] \tag{6}$$

Newey and West (1987) heteroskedasticity and autocorrelation consistent standard errors are employed (with 6 lags).

However, given the changing market conditions during the sample period, managers may have changed their alpha generation tactics over time. Thus, a second model is used, following Fung et al. (2006), which allows for break points in the relationship between strategy returns and the seven factors. The breakpoints employed in Fung et al. (2006) correspond to the collapse of Long-Term Capital Management in September 1998, and the peak of the technology bubble in March 2000. In this paper the second breakpoint corresponds to the one used in Fung et al. (2006), while the first breakpoint is slightly adjusted to fit the emerging market setting. According to Lane and Milesi-Ferretti (2006), the global financial integration accelerated in the mid-1990s, suggesting 1998 as the most significant year for a single trend break over 1970 to 2004. Hence, in this paper the first break is set to December 1998, allowing the first period to include the Asian and Russian crises as well as the LTCM crisis.

The validity of the pre-specified breakpoints is tested using the Chow (1960) test. The specification employing breakpoints is:

$$r_{st} = \alpha_1 D_1 + \alpha_2 D_2 + \alpha_3 D_3 + \beta_1 X_t D_1 + \beta_2 X_t D_2 + \beta_3 X_t D_3 + \varsigma_t \tag{7}$$

where $X_t$ is specified as in (6).
$D_1$ is a dummy variable which takes the value of one during the first period (January 1994 to December 1998) and zero otherwise, $D_2$ is one during the second period (January 1999 to March 2000) and zero otherwise, and $D_3$ is one during the third period (April 2000 to December 2004) and zero otherwise.

Monthly non-systematic returns are calculated using a rolling 12-month window over which the factor loadings are calculated. The factor loadings are then multiplied by the factor returns and subtracted from the total returns to give the non-systematic returns.

### 4.1.2 Results Factor Regressions

Table IV presents the results from the factor regressions. The first row displays the result from regressing the emerging market strategy return over the entire sample period on the factors. The next three rows are the results from splitting the sample period into the three periods described in section 4.1.1. From Table IV it is clear that emerging market hedge funds have on average not generated any statistically significant alpha in any period. However, the returns are net-of-fees, so it is possible that emerging market funds have alpha before the fees are subtracted. In that case, all return above the risk factors would be collected by the managers. Assuming that these funds do not generate alpha before fees, the conclusion, which contradicts Hypothesis 1, would be that the investors could have achieved the returns of emerging market hedge funds much cheaper by passive investments. The adjusted R-squares are between 45 and 74 percent in the regressions.

Regarding the factor loadings, emerging market hedge funds have had a positive and statistically significant loading on the MSCI World Index in all periods. Other positive and statistically significant exposures are to the small minus big factor in the second and third period and to the credit risk factor in the first and third period. It is interesting that there is no significant exposure to any of the non-linear factors (PTFs). This would indicate that emerging market hedge funds do not use derivatives to a large extent. As a contrast, Chen (2006) finds that 65% of emerging market hedge funds in the TASS database use derivatives.

The Chow (1960) test for structural breaks in the factor loadings reveals that there is no

difference between the factor loadings in the first and second period. Hence, surprisingly enough the financial crises at the end of period I did not change the alpha generating tactics employed by managers. However, there is significant break between the second and third period, indicating that the managers have changed their exposures after the high-tech bubble in 2000.

The question of interest is then how emerging market funds have performed relative to non-emerging market funds, in terms of absolute returns. The second half of Table IV shows the results from the factor regressions on non-emerging market funds, which have had a positive and significant alpha in all periods. Also, Figure 4 displays the cumulative non-systematic return over the sample period for both emerging market and non-emerging market funds. The graph confirms the previous findings. Regarding the non-systematic returns, emerging market funds have heavily underperformed other funds in terms of risk-adjusted returns.

# 5 Portfolio Optimization

The last section showed that emerging market hedge funds have failed to deliver absolute return during the period studied. If hedge funds do not generate absolute returns, there is no reason to pay the high fees that hedge funds are charging. However, if the emerging market funds' returns have low correlation with other hedge fund strategies or with other asset classes, such as equity or bonds, they could be a valuable part of a portfolio. To investigate if this is the case, portfolio optimization is performed using five different allocation models.

**Hypothesis 2:** *Emerging market hedge funds add value when combined with other assets in a portfolio.*

## 5.1 Methodology optimization

In the portfolio four assets are included: emerging market and non-emerging market hedge funds, equity, represented by excess return on the MSCI World Index and bonds, represented by the U.S. 10 year Treasury bond. Amin and Kat (2003), Schneeweis and Spurgin (1998), Hagelin and Pramborg (2004) and Davies, Kat and Lu (2005) all find that the weak relationship between hedge fund returns and the returns on other asset classes, such as equity and bonds, has a positive effect on portfolio performance.

Five allocation models are used to estimate the portfolio weights to make sure the results are not driven by assumptions made in a specific model. The five models are presented shortly below. A detailed description of the allocation models and the implementation can be found in the appendix or in DeMiguel, Garlappi and Uppal (2006).

1. *Mean-variance portfolio*: The goal of the mean-variance portfolio is to produce portfolio weights that offer the highest Sharpe ratio. It requires estimation of the expected return vector and the covariance matrix.

2. *Minimum variance portfolio*: The goal of the minimum variance portfolio is to choose portfolio weights that provide the lowest portfolio variance. It only requires estimation of the covariance matrix.

3. *Bayes-Stein shrinkage portfolio*: The Bayes-Stein shrinkage portfolio integrates estimation risk into the analysis. When estimating the expected return vector and the covariance matrix it uses shrinkage estimators.

4. *Optimal "three-fund" portfolio*: The idea behind the optimal "three-fund" portfolio is to reduce the estimation error when obtaining the tangency portfolio. Including a second risky portfolio can diversify the estimation risk given that the estimation errors of the two risky portfolios are not perfectly correlated.

5. *Bayesian "Data-and-Model" portfolio*: The Data-and-Model portfolio does not only take the data into account but also the belief that asset returns are generated by a particular asset pricing model.

The portfolio weights are constrained to be positive and sum to one. Using an expanding window, the portfolio weights are calculated every quarter. Hence, every quarter another three months of historical data is taken into consideration when estimating the required inputs. The choice of an expanding window is motivated by the short return history of hedge funds, which makes all available data valuable in the estimation.

## 5.2 Optimal Portfolio Weights in Emerging Market Hedge Funds

Table V presents the results from the optimization. The five allocation models are astonishingly unanimous. They all give the same conclusion; you should not have invested any part of your portfolio in emerging market hedge funds. The conclusion does not change if equity and bonds are excluded from the portfolio.

It is not unexpected that the minimum variance portfolio does not allocate any weight to emerging markets. Table I shows that the monthly standard deviation of the emerging market strategy is almost three times higher than for the non-emerging market strategy. Thus, the strategy will be penalized in a portfolio that only value low variance. However, it is more surprisingly that the Bayesian portfolios, who employ shrinking estimators, do not allocate any weight to emerging markets. The only model that allocates money to emerging market hedge funds on average over the period is the mean-variance portfolio, allocating one percent.

The zero investment in emerging markets is not only robust to what allocation model is used but also over time. Most portfolios have a zero weight on emerging market hedge funds in *every* quarter of the sample period. There are two exceptions, the mean-variance

portfolio and the Bayes-Stein portfolio. The initial weight in the first quarter of 1994 is eight percent in the mean-variance portfolio and three percent in the Bayes-Stein shrinkage portfolio. An allocation of as much as eight percent to the strategy is not an insignificant number. However, the weight goes down to zero by the first quarter of 1995 and remains at zero for the rest of the sample period. Hence, the weight is only positive in four out of 44 quarters analyzed.

Several robustness checks were carried out. The results proved to be robust to the length of the estimation window. The same result is obtained when using a three- or five-year rolling window. It is also robust to different definitions of the hedge fund strategies (excluding emerging markets). Again, the same result is obtained when dividing non-emerging funds into the eight strategies used in Naik et al. (2006) instead of one aggregate strategy. And finally, the result does not change when the adjustment for serial correlation in returns suggested in Getmansky, Lo and Makarov (2004) is performed.[3]

To conclude, the analysis shows, contradicting Hypothesis 2, that emerging market hedge funds do not offer any benefits that makes them valuable in a portfolio. This result is not only robust to what allocation model is used but also over time.

# 6 Investments in Emerging Market Hedge Funds

The analysis so far has showed that emerging market funds have performed poorly both in absolute terms and relative other hedge fund strategies and that they do not provide any value when included in a portfolio of hedge funds, equity and bonds. Hence, the question of interest is to what extent investors *have* invested in emerging market hedge funds?

Given the short return history of hedge funds and the poor availability of data, investors

[3]These results are available from the author.

may have had difficulties evaluating the relative performance between strategies. However, as more and better data have become available, investors should have realized that emerging market hedge funds underperform other strategies. There has also been a shift in investor base, from high net-worth individual investors to institutional investors. If the share of sophisticated investors has increased over time, then the allocation of money between hedge fund strategies should also have become more efficient. In Eichengreen et al. (1998) it is stated that "some hedge fund experts believe that emerging market hedge funds are the fastest growing segment of the hedge fund industry". In this section it is investigated if this was in fact the case. The main research question is: Have investors learned over time?

**Hypothesis 3:** *Over time, hedge fund investors have realized that emerging market funds underperform other strategies and reallocated their money away from this strategy.*

Table VI presents data on the investments in emerging market hedge funds at a yearly basis. The first column displays the total assets under management contained in the strategy at the end of each year. Figure 5 shows the evolution of AUMs, but on a monthly basis. There is an increase in total assets under management until the end of 1997. There is then a sharp decline during 1998, coinciding with the Asian and Russian financial crises as well as the collapse of LTCM. The curve then flattens out until 2002 when an almost exponential increase in AUMs in emerging market hedge funds starts. This gives the impression that allocation to emerging market hedge fund only temporarily decreased during and after the years of financial crises.

However, the second column in Table VI presents a different picture. There has been a massive inflow of money into hedge funds during the sample period (see for example Fung et al. (2006) and Naik et al. (2006)). However, the share of AUM in emerging market hedge funds in relation to the industry's total AUM has gone from about ten percent during 1994 to 1997 to only a few percent during the more recent years.

The number of emerging market hedge funds increased exponentially during the first half of the sample period, peaking with over 200 funds at the end of 1997 and beginning of 1998. The increase was followed by a decline in the number of funds during the rest of the period studied. Interestingly enough, the increase in assets under management during the late period has not been accompanied by an increase in the number of funds, leading to the conclusion that the existing funds have grown substantially in size during that period. Table VI also shows that the share of funds in the hedge fund industry that focuses on emerging markets have decreased from ten percent in 1997 to three percent in 2004. This indicates that the interest in emerging markets in the hedge fund industry has declined over time.

Since the interest in emerging market hedge funds is ultimately controlled by investors' willingness to allocate capital to this strategy, the last two columns in Table VI presents the net flow into the strategy and emerging market hedge funds' share of the total net flow into the hedge fund universe. The table shows that the strategy has had a negative flow in four out of the eleven years. Also, its share of the industry's net flow has become stable around a few percent in the last four years, from being very volatile in the first half of the sample period.

From this analysis it appears that investors have indeed learned about the underperformance of emerging market hedge funds over time and, in accordance with Hypothesis 3, have reallocated funds away from this strategy.

# 7 Evolution of performance fees

This section presents the progress of performance fees for emerging market hedge funds during the sample period. Table VII shows the AUM weighted and equally-weighted performance fees each year. For the overall period, the average value- and equally-weighted

performance fee is 14.8 and 15.8 percent, respectively. This can be compared to the corresponding number in Naik et al. (2006) for all hedge funds of 18.4 and 18.5 percent, respectively. Hence, emerging market hedge funds charge on average a lower performance fee than other hedge fund strategies. The value-weighted performance fees have had a similar development as the non-systematic return in Figure 4. The fees increase until the peak in 1997, after which they decline and then stabilize. However, the equally-weighted performance fees display a different picture. The fees actually increase steadily over time, from 13.5 percent in 1994 to 17.4 percent in 2004. This leads to the conclusion that small emerging market funds charge a significantly higher performance fee than large funds.

# 8 Do Emerging Market Hedge Fund Managers Lack Skills?

One explanation for the underperformance of emerging market hedge funds is that the managers, on average, do not possess skills. However, the performance may also be (partly) explained by other factors. In this section, several aspects that may contribute to the poor performance are discussed.

It may be the case that the small size and illiquidity of emerging markets prevent skillful managers from generating superior returns. Lesmond, Ogden and Trzcinka (1999) argue that if the value of an information signal is insufficient to outweigh the costs associated with transacting, then market participants will not trade. Hence, emerging market hedge fund managers may be able to identify investment opportunities, but refrain from acting on them as they estimate the cost of trading to be greater than the potential profits. And if they still do act on them, despite the high costs, any profit generated in the end will be small.

In a paper by Bris, Goetzmann and Zhu (2005), they show that short-selling is, if not

prohibited, very limited in most emerging countries. Thus, hedge funds may not be able to go short to take advantage of inefficiencies in emerging markets, which could affect their returns negatively. However, even if short-selling is restricted, it should still be possible to go short in the market using ADRs, single stock futures or index derivatives. However, maybe not to same degree as if short-selling was widely practiced in the market.

Also, during the more recent period, capacity constraints may partly explain the under-performance. In Naik et al. (2006) they show that for emerging market hedge funds, flows have a significant and negative impact on future alpha, indicating that capacity constraints are partly responsible for poor performance during periods of high inflows. Figure 5 showed that the assets under management in emerging market hedge funds have grown substantially during the last two years but that the number of funds has declined. Hence, the average fund size of emerging market funds has grown substantially over the sample period. Given the characteristics of emerging markets, the capacity constraints are more likely to bind than in developed markets.

Another contributing factor may be the effect from trading in illiquid assets. Aragon (2006) finds that hedge funds with lockups can more efficiently manage illiquid assets and earn an illiquidity premium. Hence, it should be important for emerging market hedge funds to employ lockups. However, in the sample 89 percent of the emerging market hedge funds do not utilize lockups, which according to the reasoning in Aragon (2006) should effect the performance negatively. This can be compared with the corresponding number for non-emerging market funds of 76 percent.

Finally, since the analysis is done on the strategy level it is clearly possible that there is a subset of managers that have skills, while the majority does not. Fung et al. (2006) find that there are significant differences between the fund-of-funds that generate alpha and those that do not, in terms of performance persistence and investor flows. Thus, a more detailed analysis at the fund-level of emerging market funds may reveal that the choice

of manager is crucial when investing in these funds.

# 9 Conclusion

This paper investigates the performance and capital flows of emerging market hedge funds during 1994 to 2004. The results reveal that emerging market hedge funds have, on average, not been able to provide absolute return during the period studied. The portfolio optimization results also clearly indicate that investors should not have invested in emerging market hedge funds during the period. Despite the underperformance of these funds in terms of alpha, they have received an almost exponential inflow during the most recent years. However, the strategy's share of the hedge fund industry's total capital flows has decreased significantly during the same period. Thus, indicating that investors have reallocated their money from emerging market hedge funds to other hedge fund strategies.

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# Appendix A: Asset Allocation Models

## A.1 Mean-Variance Portfolio

The formulas for calculating the mean-variance portfolio weights are the following:

$$\max w_t^{'}\mu_t - \frac{\gamma}{2} w_t^{'}\Sigma_t w_t \tag{8}$$

$$s.t \;\; 0 \leq w_t \leq 1 \tag{9}$$

$$\sum_{i=1}^{N} w_{it} = 1 \tag{10}$$

where $w$ is the vector of portfolio weights, $\mu$ is the vector of expected excess return over the risk free rate and $\Sigma$ is the corresponding variance-covariance matrix. The coefficient of relative risk aversion, $\gamma$, is assumed to be equal to one[4]. The portfolio weights are constrained to be non-negative and to sum to one.

Thus, the model requires estimation of the expected returns vector ($\mu$) and the variance-covariance matrix ($\Sigma$). Following DeMiguel et al. (2006), the sample moments used are:

$$\mu_t^{MV} = \frac{1}{T}\sum_{s=1}^{t} R_s \tag{11}$$

$$\Sigma t^{MV} = \frac{1}{T-N-2}\sum_{s=1}^{t}(R_s - \overline{\mu})(R_s - \overline{\mu})' \tag{12}$$

where $T$ is the number of observations and $N$ is the number of assets. $\Sigma^{MV}$ is not an unbiased estimator of $\Sigma$, but it is an unbiased estimator of $\Sigma^{-1}$.

The optimal portfolio weights are given by

[4] In DeMiguel et al. (2006) they perform a sensitivity analysis using different values for the risk aversion coefficient. They conclude that the results are not sensitive to the choice of gamma.

$$w_t^{MV} = \frac{1}{\gamma}(\Sigma_t^{MV})^{-1}\mu_t^{MV} \tag{13}$$

The mean-variance portfolio obtained with sample moments does not consider estimation error at all.

## A.2 Minimum Variance Portfolio

The minimum-variance portfolio reduces the estimation errors by only estimating the variance-covariance matrix. Also, Jagannathan and Ma (2003) show that imposing constraints on shortselling is equivalent to "shrinking" the extreme values in the variance-covariance matrix, which they demonstrate leads to a substantial improvement in portfolio performance. The formulas for calculating the minimum variance portfolio weights are

$$\min w_t' \Sigma_t w_t \tag{14}$$

$$s.t \;\; 0 \leq w_t \leq 1 \tag{15}$$

$$\sum_{i=1}^{N} w_{it} = 1 \tag{16}$$

where $w$ is the vector of portfolio weights, and $\Sigma$ is the corresponding variance-covariance matrix. The portfolio weights are constrained to be non-negative and to sum to one. The model only requires estimation of the variance-covariance matrix, which is estimates as in eq.(12).

The optimal portfolio weights are given by

$$w_t^{MIN} = \frac{1}{\mathbf{1}'(\Sigma_t^{MV})^{-1}\mathbf{1}} \times (\Sigma_t^{MV})^{-1}\mathbf{1} \tag{17}$$

## A.3 Bayes-Stein Shrinkage Portfolio

The Bayesian approach provides a general framework that integrates estimation risk into the analysis. The Bayes-Stein (BS) portfolio weights are obtained by solving the problem in eq.(8), but where instead of the sample estimates for $\mu$ and $\Sigma$ in eq.(11) and eq.(12), the investor uses shrinkage estimators, defined as a convex combination of the sample mean $\mu^{MV}$ and a global mean. The sample mean is estimated in eq.(11) and the global mean is the mean of the minimum variance portfolio, $\mu^{MIN}$. As in Jorion (1986), the following shrinkage estimators for the expected return and covariance matrix are used:

$$\mu_t^{BS} = (1-\phi)\mu_t^{MV} + \phi\mu_t^{MIN} \tag{18}$$

$$\Sigma_t^{BS} = \Sigma_t^{MV}\left(1+\frac{1}{T+\lambda}\right) + \frac{\lambda}{T(T+1+\lambda)}\frac{\mathbf{1}\mathbf{1}'}{\mathbf{1}'\left(\Sigma_t^{MV}\right)^{-1}\mathbf{1}} \tag{19}$$

where

$$\mu_t^{MIN} = \frac{\mu_t^{MV}\left(\Sigma_t^{MV}\right)^{-1}\mathbf{1}}{\mathbf{1}'\left(\Sigma_t^{MV}\right)^{-1}\mathbf{1}} \tag{20}$$

$$\phi = \frac{\lambda}{T+\lambda} \tag{21}$$

$$\lambda = \frac{N+2}{\left(\mu^{MV}-\mu^{MIN}\right)'\left(\Sigma^{MV}\right)^{-1}\left(\mu^{MV}-\mu^{MIN}\right)} \tag{22}$$

The optimal portfolio weights are given by

$$w_t^{BS} = \frac{1}{\gamma}(\Sigma_t^{BS})^{-1}\mu_t^{BS} \tag{23}$$

Kan and Zhou (2005) provide an analytical proof to show that the Bayesian portfolio rule

always dominates the maximum likelihood estimators as well as the unbiased estimator of $\Sigma^{-1}$, by yielding higher expected utility in repeated samples, regardless of the values of the true parameters. Intuitively, this should be the case because the Bayesian portfolio rule incorporates uncertainty into decision-making while the previous models simply ignore it.

## A.4 Optimal "Three-Fund" Portfolio

Kan and Zhou (2005) propose a "three-fund" portfolio rule to deal with estimation error. Theoretically, if a mean-variance optimizing investor knows the true parameters, she should invest only in the riskless asset and the tangency portfolio. However, when the parameters are unknown, the tangency portfolio is obtained with estimation error. Including another risky portfolio can help to diversify the estimation risk of the sample tangency portfolio.Kan and Zhou (2005) solve analytically for the the optimal portfolio weights in a three-fund universe that consists of the riskless asset, the sample tangency portfolio, and the sample global minimum-variance portfolio. The global minimum-variance portfolio is used since it only requires estimation of the variance-covariance matrix, which reduces estimation errors. The relative weights in the two risky portfolios depend on the estimation errors of the two portfolios, their correlation, and their risk-return trade-offs.

The optimal three-fund rule in Kan and Zhou (2005) can be thought of as a shrinkage rule with a particular choice of shrinkage estimator of $\mu$ and a particular choice of $\Sigma$. Hence, the model solves the same problem as in the Bayes-Stein model but with $\Sigma^{III}$ instead of $\Sigma^{BS}$ to estimate $\Sigma$, so that

$$(\Sigma_t^{III})^{-1} = \frac{(T-N-1)(T-N-4)}{T(T-2)} \left(\Sigma_t^{MV}\right)^{-1} \tag{24}$$

and the use of the Bayes-Stein shrinkage estimator $\mu^{BS}$, eq.(11), with the value of

$$\phi = \frac{N}{N + T\psi_a^2} \tag{25}$$

That is,

$$\mu_t^{III} = \left[\frac{T\psi_a^2}{N + T\psi_a^2}\right]\mu_t^{MV} + \left[\frac{N}{N + T\psi_a^2}\right]\mu_t^{MIN}\mathbf{1} \tag{26}$$

where

$$\psi_a^2 = \frac{(T - N - 1)\psi^2 - (N - 1)}{T} + \frac{2(\psi^2)^{\frac{N-1}{2}}(1 + \psi^2)^{-\frac{T-2}{2}}}{TB_{\psi^2/(1+\psi^2)}((N-1)/2, (T - N + 1)/2)} \tag{27}$$

$$\psi^2 = (\mu_t^{MV} - \mu_t^{MIN})'(\Sigma_t^{MV})^{-1}(\mu_t^{MV} - \mu_t^{MIN}) \tag{28}$$

and where the incomplete Beta function is given by

$$B_x(a, b) = \int_0^x y^{a-1}(1 - y)^{b-1}dy \tag{29}$$

The optimal portfolio weights are

$$w_t^{III} = \left(\Sigma_t^{III}\right)^{-1}\mu_t^{III} \tag{30}$$

## A.5 Bayesian "Data-and-Model" Portfolio

In a Bayesian framework, informative priors other than the diffuse one may be used. For examples, Pástor (2000) and Pástor and Stambaugh (2000) provide priors that incorporate certain beliefs on the usefulness of the CAPM and study their impacts on asset allocation decisions. Hence, under this "Data-and Model" approach estimation of the moments of asset returns is done using not just the data but also the belief that the asset returns are generated by a particular asset-pricing model. Thus, the Bayesian "Data-and-Model" approach shrinks both the expected returns and the variance-covariance matrix, as demonstrated in Wang (2005).

The model is derived as follows. There are N risky assets and let $r_{1t}$ be the vector of excess returns over the risk-free rate on the assets during period t. The asset pricing model is given and there are $K$ factor portfolios in the model. Let $r_{2t}$ be the vector of excess returns on the factor portfolios during period t. The time series of T observations are assumed to follow a normal distribution with mean $\mu$ and variance $\Omega$, independently across t. The mean and variance are decomposed into the following parts corresponding to the $N$ assets and $K$ factors.

$$\mu = \begin{pmatrix} \mu_1 \\ \mu_2 \end{pmatrix}, \Omega = \begin{pmatrix} \Omega_{11} & \Omega_{12} \\ \Omega_{21} & \Omega_{22} \end{pmatrix} \tag{31}$$

The mean and variance can be summarized by the parameters in the regression model:

$$r_{1t} = \alpha + \beta r_{2t} + u_t \tag{32}$$

where $\alpha$ is the vector of Jensen's alpha, $\beta$ is the matrix of the betas, and $u_t$ is the vector of the residual terms in the regression. The variance of $u_t$ is assumed to be $\Sigma$. It follows that the mean and variance of the returns can be expressed as

$$\mu = \begin{pmatrix} \alpha + \beta\mu_2 \\ \mu_2 \end{pmatrix}, \Omega = \begin{pmatrix} \beta\Omega_{22}\beta' + \Sigma & \beta\Omega_{22} \\ \Omega_{22}\beta' & \Omega_{22} \end{pmatrix} \tag{33}$$

The asset pricing model, $\mu_1 = \beta\mu_2$, only holds if $\alpha$ is a vector of zeros.

In the classical framework of asset allocation using asset-pricing models, investors choose either to believe or not to believe the asset-pricing model. Those who do not believe the asset-pricing model estimate the parameters without restricting $\alpha$ to be zero. Denote the maximum likelihood estimates of $\alpha$, $\beta$ and $\Sigma$ by $\widehat{\alpha}$, $\widehat{\beta}$ and $\widehat{\Sigma}$ respectively. Similarly, let $\overline{\beta}$ and $\overline{\Sigma}$ be the estimates obtained when estimating the regression model with the restriction that $\alpha = 0$. These would be the estimators chosen by an investor who dogmatically

believes in the asset pricing model. The Bayesian framework introduces an informative prior distribution of $\alpha$ to represent an investor's belief in the asset pricing model. The prior of $\alpha$, conditional on $\Sigma$, is assumed to be a normal distribution with mean 0 and variance $\theta\Sigma$, i.e.

$$p(\alpha \mid \Sigma) = N(0, \theta\Sigma) \tag{34}$$

The parameter $\theta$ is a positive number that controls the variance of t he prior distribution of Jensen's alpha.

Under the assumptions described above, Wang (2005) shows how to obtain estimators for the expected return and variance-covariance matrix that account for the belief of a Bayesian investor over the validity of a particular asset pricing model.

If $\widehat{S}$ denotes the highest Sharpe ratio of the efficient frontier spanned by the mean and variance of the factor portfolios, i.e.

$$\widehat{S}^2 = \widehat{\mu}_2' \widehat{\Omega}_{22}^{-1} \widehat{\mu}_2 \tag{35}$$

and let $\omega$ denote the degree of confidence a Bayesian investor places in the asset-pricing model. If $\omega = 1$ then the investor has a dogmatic belief in the model.

$$\omega = \frac{1}{1 + T\theta/(1 + \widehat{S}^2)} \tag{36}$$

Then, a Bayesian "Data-and-Model" investor with a degree of confidence $\omega$ in the model will use the following shrinkage estimators of the expected return and variance-covariance matrix of the investable assets:

$$\widehat{\mu}^{DM} = \omega \begin{pmatrix} \overline{\beta}\widehat{\mu}_2 \\ \widehat{\mu}_2 \end{pmatrix} + (1-\omega) \begin{pmatrix} \widehat{\mu}_1 \\ \widehat{\mu}_2 \end{pmatrix} \tag{37}$$

$$\widehat{\Omega}^{DM} = \begin{pmatrix} V_{11}(\omega) & V_{12}(\omega) \\ V_{12}(\omega)' & b\widehat{\Omega}_{22} \end{pmatrix} \tag{38}$$

where $V_{11}(\omega)$ and $V_{12}(\omega)$ are given by

$$V_{11}(\omega) = b\left[\omega\overline{\beta} + (1-\omega)\widehat{\beta}\right]\widehat{\Omega}_{22}\left[\omega\overline{\beta} + (1-\omega)\widehat{\beta}\right]' + h\left[\omega\overline{\delta} + (1-\omega)\widehat{\delta}\right]\left[\omega\overline{\Sigma} + (1-\omega)\widehat{\Sigma}\right] \tag{39}$$

$$V_{12}(\omega) = b\left[\omega\overline{\beta} + (1-\omega)\widehat{\beta}\right]\widehat{\Omega}_{22} \tag{40}$$

Here, $\overline{\delta}$, $\widehat{\delta}$, $b$ and $h$ are scalars and defined as follows:

$$\overline{\delta} = \frac{T(T-2)+K}{T(T-K-2)} - \frac{K+3}{T(T-K-2)}\frac{\widehat{S}^2}{(1+\widehat{S}^2)} \tag{41}$$

$$\widehat{\delta} = \frac{(T-2)(T+1)}{T(T-K-2)} \tag{42}$$

$$b = \frac{T+1}{T-K-2} \tag{43}$$

$$h = \frac{T}{T-N-K-1} \tag{44}$$

The mean equation states that the predictive mean is a weighted average of the estimated means restrictive and unrestrictive by the asset-pricing model. It is a shrinkage estimator. The shrinkage target is the maximum likelihood estimate of $\mu$ under the restriction of the asset pricing model. The asset-pricing model considered is the 7-factor model developed in Fung and Hsieh (2004*b*). In the implementation of the Data-and-Model approach the

investor is assumed to believe in the asset allocation model with a subjective probability of 50 percent (i.e. $\omega = 0.5$).

# Table I
# Summary Statistics

This table presents summary statistics for the emerging market and the non-emerging market hedge funds in the sample. The first panel displays, in rows, the number of funds in the sample, the average life in years, average fund AUM and the percentage of funds that employ lockup periods. The two last panels show summary statistics for the monthly value-weighted returns (in excess over the three-month U.S. Treasury bill) and the monthly total flows as a percentage of strategy AUM, respectively. The summary statistics presented in rows are the mean, median, standard deviation, minimum and maximum.

| **Summary Statistics** | **Emerging Markets** | **Non-Emerging Markets** |
|---|---|---|
| *Number of funds* | 418 | 7,187 |
| *Average life in years* | 4.4 | 4.5 |
| *Average AUM (US $MN)* | 75.6 | 100.6 |
| *Funds with lockups (%)* | 11 | 24 |
| **Excess return (%)** | | |
| *Mean* | 0.48 | 0.51 |
| *Median* | 1.18 | 0.48 |
| *Standard deviation* | 4.73 | 1.72 |
| *Minimum* | -22.71 | -5.65 |
| *Maximum* | 15.04 | 5.77 |
| **Flows (%)** | | |
| *Mean* | 0.40 | 0.84 |
| *Median* | 0.44 | 0.80 |
| *Standard deviation* | 1.44 | 0.76 |
| *Minimum* | -3.83 | -0.82 |
| *Maximum* | 4.22 | 4.20 |

# Table II
# Geographical Distribution of Assets under Management
# Emerging Market Hedge Funds

This table presents the geographical distribution of assets under management (AUM) over time for emerging market hedge funds. Panel A displays the percentage of total strategy AUM that is allocated in each focus market (in columns) at the end of the year given in rows. The last row shows the total assets under management contained in the strategy at the end of the year. Panel B presents the percentage of total strategy AUM managed by region (in columns) at the end of each year, given in rows. The region is defined by the location of the management company's headquarter. The last column displays the results for funds with unknown location of headquarter.

**Panel A: Distribution across Focus Markets**

| Year | Asia | Europe | Latin America | Global | Tot AUM $Bn |
|---|---|---|---|---|---|
| *1994* | 14% | 14% | 0% | 72% | 7.26 |
| *1995* | 13% | 11% | 0% | 76% | 7.92 |
| *1996* | 14% | 12% | 6% | 68% | 11.90 |
| *1997* | 19% | 11% | 6% | 64% | 19.55 |
| *1998* | 21% | 8% | 5% | 66% | 9.25 |
| *1999* | 17% | 9% | 7% | 67% | 11.29 |
| *2000* | 15% | 7% | 6% | 72% | 8.58 |
| *2001* | 18% | 5% | 13% | 64% | 8.28 |
| *2002* | 18% | 3% | 13% | 66% | 9.78 |
| *2003* | 17% | 3% | 12% | 68% | 15.19 |
| *2004* | 16% | 2% | 13% | 68% | 22.32 |

**Panel B: Distribution across Location of Management Companies**

| Year | Asia | Europe | Offshore | U.S. | Latin America | Location N/A |
|---|---|---|---|---|---|---|
| *1994* | 5% | 26% | 12% | 51% | 5% | 2% |
| *1995* | 5% | 24% | 10% | 55% | 6% | 1% |
| *1996* | 6% | 30% | 9% | 43% | 9% | 2% |
| *1997* | 11% | 30% | 14% | 40% | 4% | 2% |
| *1998* | 9% | 31% | 14% | 42% | 2% | 2% |
| *1999* | 9% | 33% | 14% | 40% | 3% | 1% |
| *2000* | 10% | 31% | 14% | 41% | 4% | 1% |
| *2001* | 11% | 20% | 21% | 45% | 4% | 1% |
| *2002* | 11% | 15% | 17% | 51% | 4% | 2% |
| *2003* | 12% | 19% | 12% | 52% | 3% | 2% |
| *2004* | 10% | 17% | 13% | 57% | 2% | 0% |

# Table III
# Number of Emerging Market Hedge Funds

For each year represented in a row, this table presents the number of funds in the data at the end of each year, the number of funds that entered the data during the year and the number of funds that exited the data during the year.

| Year | Number of Funds End of Year | Entered (%) | Exited (%) |
|---|---|---|---|
| *1995* | 129 | 51 | 5 |
| | | (61%) | (6%) |
| *1996* | 182 | 69 | 16 |
| | | (53%) | (12%) |
| *1997* | 209 | 68 | 41 |
| | | (37%) | (23%) |
| *1998* | 195 | 47 | 61 |
| | | (22%) | (29%) |
| *1999* | 188 | 29 | 36 |
| | | (15%) | (18%) |
| *2000* | 173 | 25 | 40 |
| | | (13%) | (21%) |
| *2001* | 129 | 5 | 49 |
| | | (3%) | (28%) |
| *2002* | 128 | 10 | 11 |
| | | (8%) | (9%) |
| *2003* | 132 | 26 | 22 |
| | | (20%) | (17%) |
| *2004* | 124 | 4 | 12 |
| | | (3%) | (9%) |

# Table IV
# Value Weighted Index: Factor Regressions

This table presents results from regressing monthly hedge fund strategy index returns on the Fung and Hsieh (2004b) factors. The left hand-side variable in each regression is the AUM weighted (net-of fees) excess return of the hedge fund strategy. The seven right hand-side variables are excess return on the MSCI World Index (World); a small minus big (SMB) capitalization factor; excess returns on three portfolios of lookback straddle options (PTFs) on bonds, commodities and foreign exchange; the spread of Moody's BAA corporate bond returns index over the U.S. 10 year maturity Treasury bond (BAA spread), and finally the excess return of the U.S. 10-year maturity Treasury bond. All excess returns are over the U.S. 3 month Treasury bill rate. For each period represented in a row, the columns present the intercept (alpha), the slope coefficients on the seven factors and the R-square. Newey-West (1987) heteroskedasticity and autocorrelation consistent standard errors are employed (6 lags). Significance at the one, five and ten percent level is given by ***, ** and * respectively.

As indicated in rows, the regression is performed first on overall sample and then on three sub-periods; January 1994 to December 1998 (Period I: Asian and Russian and LTCM crises), January 1999 to March 2000 (Period II: Bubble period) and April 2000 to December 2004 (Period III: Post-bubble period).

The last two columns present the result from testing for two sample breaks; between period I and period II and between period II and period III. Test for structural breaks using the dummy variant of the Chow (1960) test is applied only to slope coefficients, not constant term. The value of the F-statistic is shown in the table below and the critical value (alpha=0.05) is 2.167.

| **Returns** | $\alpha$ | **World** | **SMB** | **PTF Bonds** | **PTF Com** | **PTF FX** | **BAA Spread** | **TCM 10 Y** | $R^2$ | **I=II?** | **II=III?** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Emerging Market** | | | | | | | | | | | |
| Overall period | 0.135 | 0.644*** | 0.321*** | -0.033 | -0.001 | 0.003 | 0.604** | 0.134 | 0.490 | | |
| Period I | -0.800 | 0.781*** | 0.243 | -0.042 | 0.009 | 0.002 | 1.484** | -0.043 | 0.455 | 1.011 | 2.474** |
| Period II | 0.748 | 1.232** | 0.504*** | 0.031 | -0.030 | -0.002 | 0.128 | -0.823 | 0.735 | | |
| Period III | 0.544 | 0.538*** | 0.230** | 0.002 | 0.041 | -0.002 | 0.418* | 0.298** | 0.670 | | |
| **Non-Emerging Market** | | | | | | | | | | | |
| Overall period | 0.387*** | 0.252*** | 0.148*** | -0.008 | 0.017 | 0.012* | 0.155 | 0.198*** | 0.541 | | |
| Period I | 0.465*** | 0.263*** | 0.163** | -0.016 | 0.037** | 0.012 | 0.516* | 0.300*** | 0.500 | 3.157*** | 17.719*** |
| Period II | 0.459*** | 0.366*** | 0.303*** | 0.035** | -0.017*** | -0.002 | 0.390 | 0.223 | 0.967 | | |
| Period III | 0.205*** | 0.194*** | 0.122*** | 0.000 | 0.016** | 0.010* | 0.069 | 0.138*** | 0.737 | | |

# Table V
# Portfolio Optimization

This table presents results from optimizing over returns on four assets: emerging market hedge funds, non-emerging market hedge funds, equity (MSCI World Index) and bonds (U.S. 10-year maturity Treasury bond). All returns are monthly excess returns over the 3-month U.S. Treasury bill. The portfolio weights are constrained to be between zero and one and to sum to one.

The optimization is performed using an expanding window and the weights are estimated quarterly during 1994 to 2004. In the table below the mean weight over this period, the standard deviation, the initial and ending weights are indicated in rows for both portfolios. Five different optimization models are used: Mean-variance portfolio, Minimum-variance portfolio, Bayes-Stein shrinkage portfolio, Optimal 3-fund portfolio (Kan and Zhou (2005)) and Bayesian Data-and-Model Portfolio (Pastor (2000), Pastor and Stambaugh (2000)), as indicated in columns.

| **Weights** | **Mean-Variance** | **Minimum-Variance** | **Bayes-Stein** | **3-fund** | **Data&Model** |
|---|---|---|---|---|---|
| *Mean* | | | | | |
| Emerging markets | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Non-Emerging markets | 0.94 | 0.88 | 0.92 | 0.90 | 0.88 |
| Equity | 0.01 | 0.02 | 0.02 | 0.02 | 0.03 |
| Bonds | 0.04 | 0.10 | 0.06 | 0.08 | 0.09 |
| *Standard deviation* | | | | | |
| Emerging markets | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Non-Emerging markets | 0.03 | 0.01 | 0.02 | 0.02 | 0.03 |
| Equity | 0.02 | 0.02 | 0.02 | 0.02 | 0.03 |
| Bonds | 0.03 | 0.06 | 0.05 | 0.07 | 0.06 |
| *Initial weight* | | | | | |
| Emerging markets | 0.08 | 0.00 | 0.03 | 0.00 | 0.00 |
| Non-Emerging markets | 0.87 | 0.84 | 0.87 | 0.85 | 0.79 |
| Equity | 0.00 | 0.04 | 0.02 | 0.04 | 0.00 |
| Bonds | 0.05 | 0.12 | 0.08 | 0.11 | 0.21 |
| *Final weight* | | | | | |
| Emerging markets | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Non-Emerging markets | 0.95 | 0.88 | 0.92 | 0.91 | 0.89 |
| Equity | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Bonds | 0.05 | 0.12 | 0.08 | 0.09 | 0.11 |

# Table VI
# Investments in Emerging Market Hedge Funds

This table presents the assets under management (AUM), number of funds and net flows in emerging market hedge funds each year and the respective share of the same for emerging market hedge fund strategy in the hedge fund industry.

| | AUM | | Number of Funds | | Net Flows | |
|---|---|---|---|---|---|---|
| **Year** | **Emerging (US $BN)** | **% of industry** | **Emerging** | **% of industry** | **Emerging (US $BN)** | **% of industry** |
| *1994* | 7.26 | 10% | 83 | 7% | 1.09 | 35% |
| *1995* | 7.92 | 9% | 129 | 9% | -0.25 | -48% |
| *1996* | 11.90 | 9% | 182 | 9% | 0.54 | 6% |
| *1997* | 19.55 | 10% | 209 | 10% | 2.45 | 10% |
| *1998* | 9.25 | 4% | 195 | 8% | -0.91 | -5% |
| *1999* | 11.29 | 4% | 188 | 7% | -1.09 | -12% |
| *2000* | 8.58 | 3% | 173 | 6% | -0.23 | -1% |
| *2001* | 8.28 | 2% | 129 | 4% | 0.03 | 0% |
| *2002* | 9.78 | 2% | 128 | 3% | 0.65 | 2% |
| *2003* | 15.19 | 3% | 132 | 3% | 1.67 | 2% |
| *2004* | 22.32 | 3% | 124 | 3% | 3.59 | 4% |

# Table VII
# Performance Fee Structure: Emerging Market Hedge Funds

This table presents the evolution of performance fees for emerging market hedge funds over the sample period. The first column presents the AUM weighted performance fee in percent for emerging market hedge funds, for the years indicated in rows. The second column presents the equally-weighted performance fees. The last row displays the average fees over the period.

| **Year** | **Value-weighted** | **Equally-weighted** |
|---|---|---|
| *1994* | 13.58 | 13.52 |
| *1995* | 15.16 | 13.79 |
| *1996* | 14.88 | 14.68 |
| *1997* | 16.45 | 16.37 |
| *1998* | 15.32 | 16.24 |
| *1999* | 14.15 | 16.38 |
| *2000* | 15.14 | 16.23 |
| *2001* | 14.14 | 16.04 |
| *2002* | 14.65 | 16.39 |
| *2003* | 14.39 | 17.07 |
| *2004* | 14.74 | 17.38 |
| Average | 14.78 | 15.83 |

**Figure 1: Geographical Distribution of Focus Markets for Emerging Market Hedge Funds**

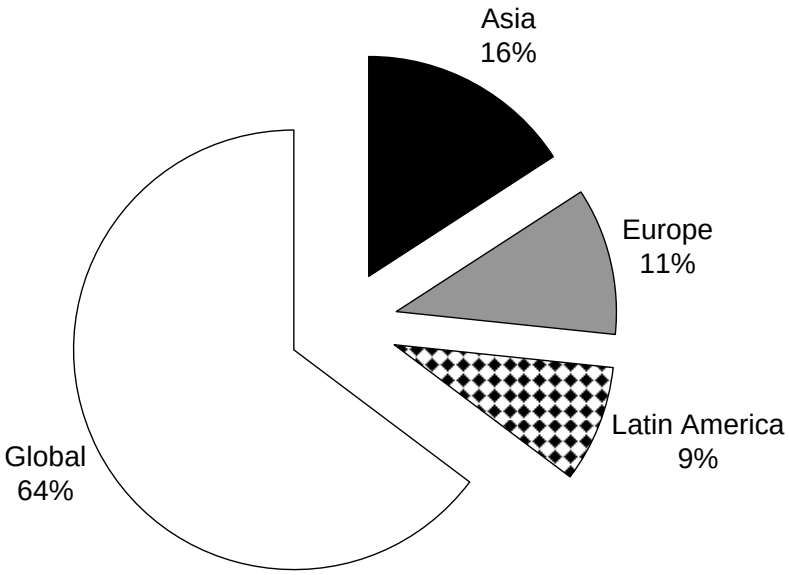
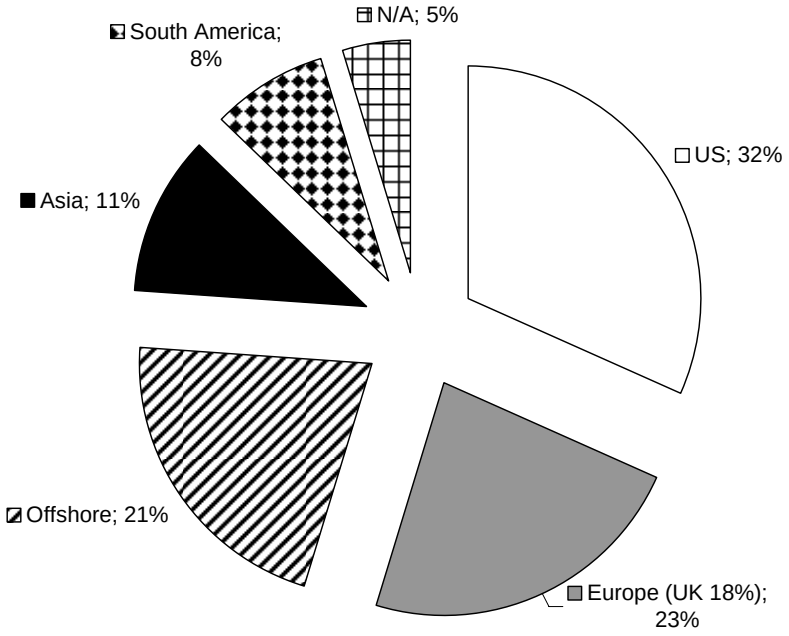
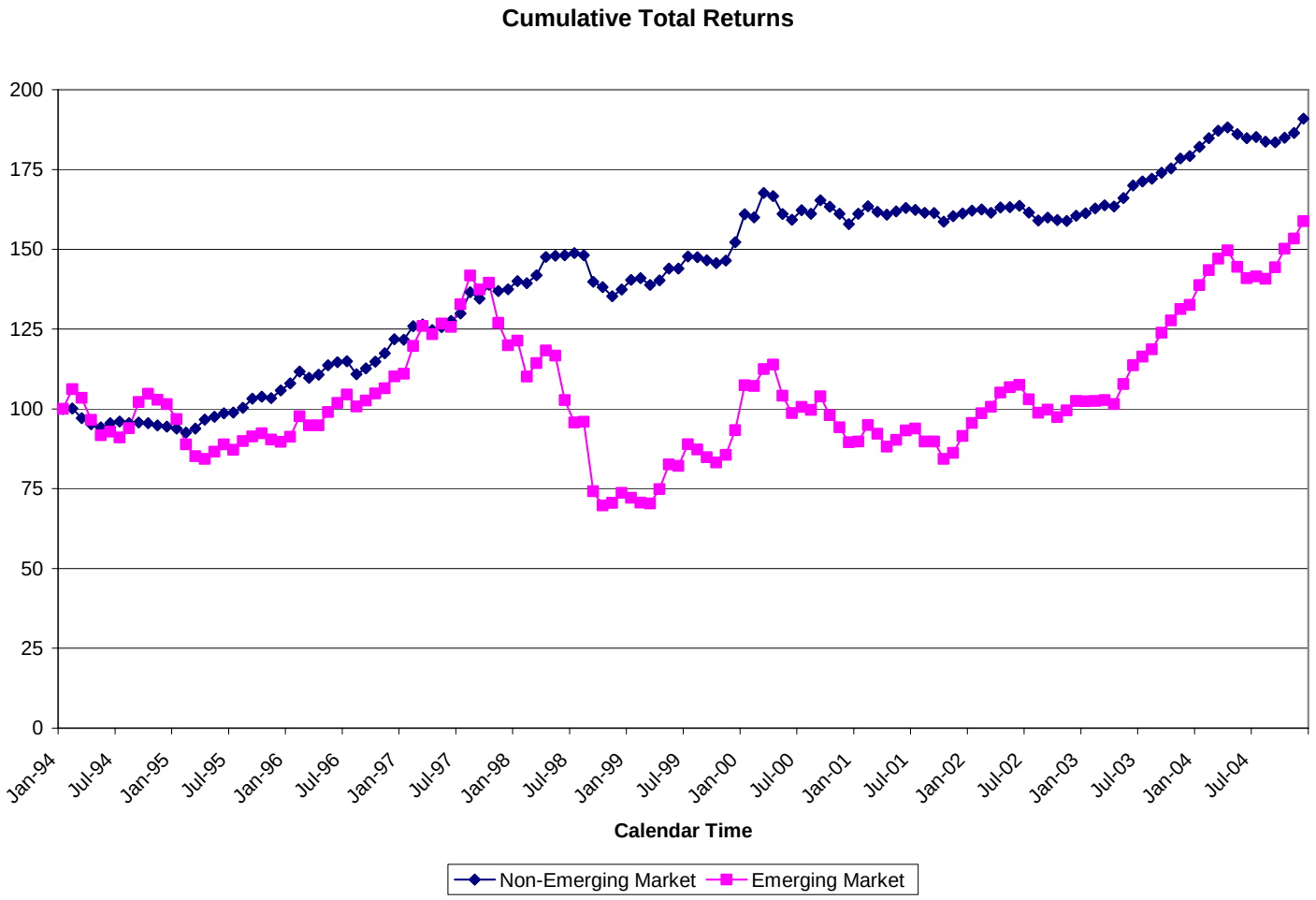



**Figure 2: Geographical Distribution of Management Companies for Emerging Market Hedge Funds**



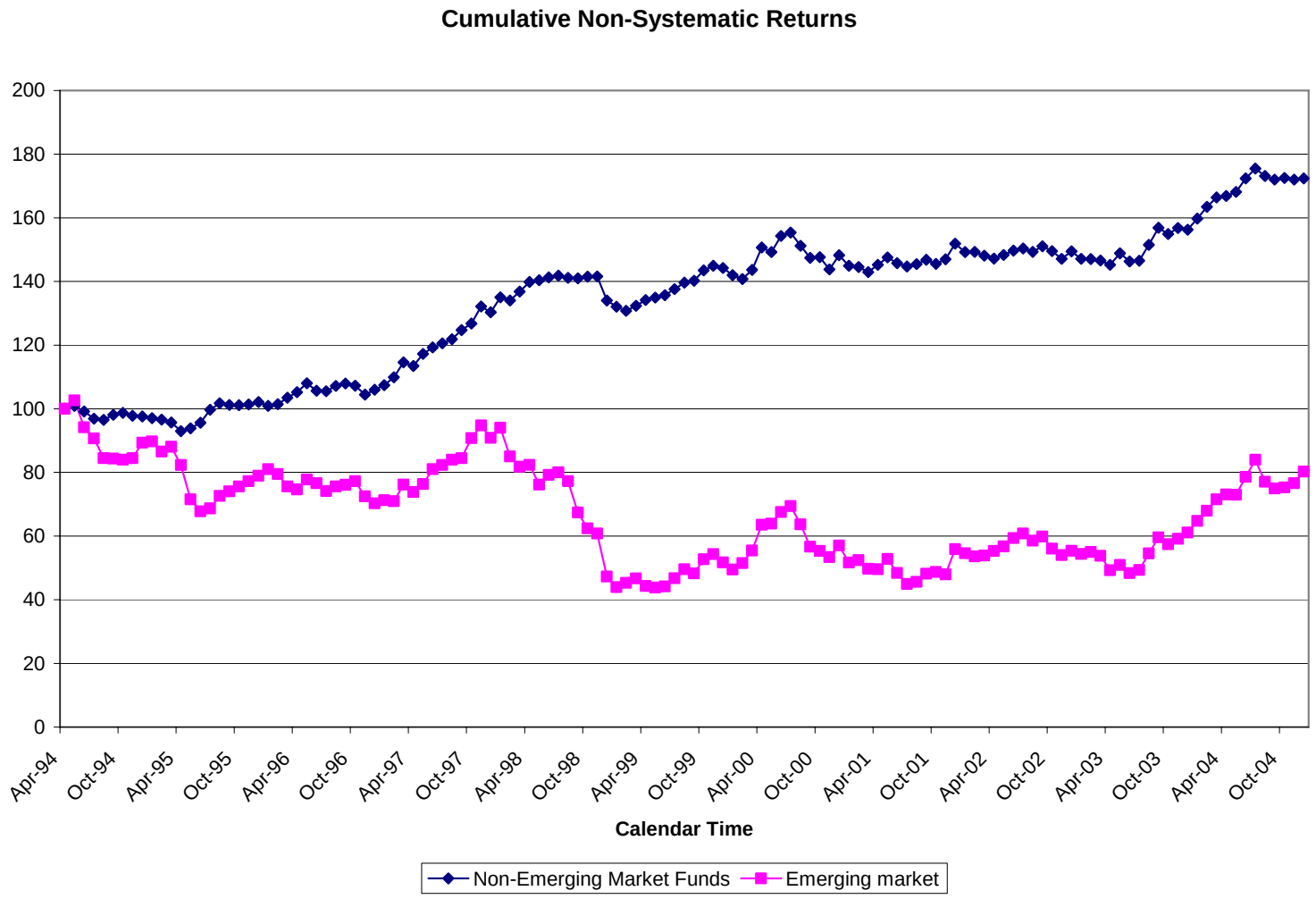
## Figure 3: Cumulative Total Returns

The figure plots the cumulative total value-weighted excess return indices of the emerging market strategy and all other hedge funds. The data begin in the first month of 1994 and end in the final month of 2004.



## Figure 4: Cumulative Non-Systematic Returns

The figure plots the cumulative non-systematic value-weighted excess return indices of emerging market hedge fund and all other hedge funds. The data begin in April 1994 and end in December 2004.



## Figure 5: Number of Funds and Total AUM

This figure plots the evolution of the number of emerging market hedge funds and the total assets under management (AUM) contained in the strategy in the sample across time measured in months. The data are constructed by aggregating information from TASS, HFR, CISDM and MSCI for funds that report AUM. The data begin in the first month of 1994, and end in the final month of 2004.